Electronic Version
Stylesheet Version v1.1.1

Claims

[c1] 1. An energy dissipative element for use in protecting a hosted device from deleterious effects of mechanical shocks and vibrations, the energy dissipative element comprising:
a closed envelope formed of an elastic, resilient wall and enclosing an internal volume;
a porous body of elastic material contained within the internal volume of said closed envelope, wherein said body defines a network of cells interconnected through cell orifices suitably configured for passing viscous liquid between cells; and
a viscous liquid contained within said envelope and filling at least a portion of said network of interconnected cells, wherein under compression or expansion of the porous body, said viscous liquid flows through said cell orifices and thereby dissipates energy resulting from an external force applied against said elastic wall; and
a compressible gas occupying a portion of the internal volume of the envelope.

[c2] 2. An energy dissipative element, as claimed in claim 1, wherein:

said closed envelope is made of latex rubber.

[c3] 3. The energy dissipative element of claim 1, wherein said closed envelope is a tubular structure and further comprises:
a sealing means closing the opposite ends of the tubular structure.

[c4] 4. The energy dissipative element of claim 3, wherein said sealing means is selected from the group consisting of a bonded seal, an adhesive seal, a compression seal, and any combination thereof.

[c5] 5. The energy dissipative element of claim 4, wherein said bonded seal comprises a vulcanized seal bonding shut an end of said envelope.

[c6] 6. The energy dissipative element of claim 4, wherein said adhesive seal comprises super glue adhering shut an end of said envelope.

[c7] 7. The energy dissipative element of claim 4, wherein said compression seal comprises a band of heat shrink tubing compressing shut an end of said envelope.

[c8] 8. An energy dissipative element, as claimed in claim 1, wherein:
a substantial portion of said cell orifices are relatively

smaller in transverse dimension than the cells interconnected by them.

[c9] 9. An energy dissipative element, as claimed in claim 1, wherein:
said viscous liquid is polydimethylsiloxane (PDMS).

[c10] 10. An energy dissipative element, as claimed in claim 9, wherein:
said polydimethylsiloxane is of a viscosity of less than 20,000 centistokes (cs).

[c11] 11. An energy dissipative element, as claimed in claim 9, wherein:
said polydimethylsiloxane is of a viscosity of about 10,000 centistokes (cs).

[c12] 12. An energy dissipative element, as claimed in claim 9, wherein:
said polydimethylsiloxane is of a viscosity of about 500 centistokes (cs).

[c13] 13. An energy dissipative element, as claimed in claim 1, wherein:
said viscous liquid is of a viscosity of less than 20,000 centistokes (cs).

[c14] 14. An energy dissipative element, as claimed in claim 9,

wherein:
said viscous liquid is of a viscosity of about 10,000 centistokes (cs).

[c15] 15. An energy dissipative element, as claimed in claim 9, wherein:
said viscous liquid is of a viscosity of about 500 centistokes (cs).

[c16] 16. A host module assembly for protecting a hosted device from shock and vibration, comprising:
a case suitably configured to receive a hosted device therein and to receive at least one mechanical energy dissipative element between the hosted device and said case;
a hosted device located within the case; and
at least one mechanical energy dissipative element located between said hosted device and the case;
wherein said mechanical energy dissipative element comprises:
a closed envelope formed of an elastic, resilient wall and enclosing an internal volume;
a porous body of elastic material contained within the internal volume of said closed envelope, wherein said body defines a network of cells interconnected through cell orifices suitably configured for passing viscous liquid between cells; and

a viscous liquid contained within said envelope and filling at least a portion of said network of interconnected cells, wherein under compression or expansion of the porous body, said viscous liquid flows through said cell orifices and thereby dissipates energy resulting from an external force applied against said elastic wall; and
a compressible gas occupying a portion of the internal volume of the envelope.

[c17] 17. The host module assembly of claim 16, wherein:
said hosted device is a disk drive in a housing having six faces;
said case is suitably sized to receive at least one mechanical energy dissipative element between each of said six faces and the case; and
at least six of said mechanical energy dissipative elements are located between the disk drive housing and the case, with at least one between each face of the disk drive housing and the case.

[c18] 18. The host module assembly of claim 16, wherein said case is configured with at least one external corner, further comprising:
a bumper formed of elastomer material and attached over said at least one corner.

[c19] 19. The host module assembly of claim 18, wherein the

elastomer material of said bumper is of 6 dm to 70 dm.

[c20] 20. The host module assembly of claim 16, wherein:
said hosted device is a disk drive; and
said case is of a common form factor;
whereby said mechanical energy dissipative element provides a ruggedized disk drive system.

[c21] 21. The host module assembly of claim 20, wherein:
said disk drive is selected from a 3.5-inch, 3.0-inch, 2.5-inch, or 1-inch form factor disk drives.

[c22] 22. The host module assembly of claim 20, further comprising:
means for mounting said case into a computer system, whereby said mechanical energy dissipative element provides the protection from shock and vibration during the installation of said disk drive cartridge module into a computer system.

[c23] 23. The host module assembly of claim 20, further comprising:
means for mounting a plurality of said cases into a computer system, whereby said mechanical energy dissipative element provides the protection from shock and vibration during the installation of a plurality of said disk drive cartridges into a dense array of disk drives in a

computer system.

[c24] 24. The host module assembly of claim 16, wherein: said hosted device is a disk drive; and said case is a shipping container, whereby the disk drive is protected from shock and vibration during transportation and handling.

[c25] 25. The host module assembly of claim 16, wherein: the hosted device is a portable electronics device.

[c26] 26. The host module assembly of claim 16, wherein: the hosted device is selected from the group consisting of personal digital assistants (PDAs), cameras, camcorders, and liquid crystal diode panels.

[c27] 27. A method of dissipating energy released due to external forces that cause deleterious mechanical shocks and vibrations to a disk drive, said method comprising:
placing a plurality of closed elastic envelopes around the disk drive;
providing an open cell material within each of the envelopes having orifices communicating at least some of the cells with each other;
filling at least some of the cells with a viscous liquid material; and
deforming the elastic envelope and forcing the viscous

liquid through the orifices from one cell to another within the at least one elastic envelope in response to an external mechanical force on the at least one elastic envelope to dissipate energy from the external mechanical force.

[c28] 28. A method as claimed in claim 27, including the further steps of:
essentially returning the at least one elastic envelope to its original shape due to the energy stored in the at least one elastic envelope as a result of its deformation; and returning the viscous liquid through the orifices from one cell to another by forces generated within the viscous liquid.